PATENT SPECIFICATION 1,179,151

DRAWINGS ATTACHED.

1,179,151

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COMPLETE SPECIFICATION

Improvements in or relating to Apparatus for Injecting Paste-Like Substances.

We, SIKKENS GROEP N.V., a limited liability Company incorporated under the laws of The Netherlands, of Sassenheim, The Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The present invention relates to an apparatus for injecting paste-like substances.

It is known to inject substances into wood for curative treatment of decayed wood, which is located already in a building. Such injection is preferably effected in the immediate vicinity of the threatened portions in order to impregnate the wood there with a wood preserving agent and/or filling material.

Besides fungi- and insect killing agents the known wood treating agents also comprise agents for filling and sealing seams, cracks, wind shakes, as well as capillary and other openings in the wood. The attacked wood is rendered suitable again for further use because the decayed portions are filled with these filling-materials. Also wide seams such as those between wooden parts of a building and adjacent brick work, as well as between glass and window frames may be filled by injection or filling-material into these seams. Furthermore besides filling spaces in the wood, these agents to be injected may have glueing properties by which moreover remaining wooden portions again adhere to each other.

These fillers, as these substances with besides a filling also a possible glueing property will be called hereinafter, may comprise an artificial resin or a mixture of an artificial resin and a hardening agent. Herewith connections between various construction components, such as glass, wood and walls can be effected, whereas at the same time the penetration of water can be prevented.

In general these artificial resins form a paste-like mass which, after being forced into wood, hardens after some time in the wood to a more or less flexible solid mass.

A known device for injecting these fillers into wood comprises a pressure chamber and a needle-shaped nozzle. The substance to be injected is to be introduced into the pressure chamber and thereafter during the injection itself is forced from the pressure chamber through the injection needle into the wood by air pressure.

A disadvantage of the known injection device is that the pressure chamber and the conduit leading to the nozzle easily become clogged owing to the pasty and sticky properties of the filling-materials and that, if the device is not cleaned immediately after use the paste-like mass may harden both in the pressure chamber and in the conduit to the nozzle with disadvantageous consequences.

To eliminate the disadvantages of the known device the present invention visualises the filling paste coming as much as possible into contact with portions of the injection device that are cheap and disposable after use. The device furthermore should preferably be able to force the paste-like and thus viscous substance deeply into capillary and thus narrow spaces, which consequently requires high pressures.

According to the present invention an apparatus for injecting paste-like substances comprises a pressure chamber which is adapted to be connected to a source of com-

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pressed fluid, as exchangeable and disposable cartridge for containing the paste-like substance, the cartridge being located in said pressure chamber so that its outer periphery is completely spaced from the wall of the pressure chamber whereby admittance of compressed fluid into said pressure chamber places the cartridge under effective all-sided pressure from the compressed fluid, an injector nozzle connected to the pressure chamber and communicating with the cartridge, the cartridge having a piston propellable by the pressure of compressed fluid in said pressure chamber toward one end wall of the cartridge to thereby cause paste-like substance to be extruded through the nozzle, and a replaceable connection locatable, in use, in the communication between the nozzle and the cartridge.

An additional advantage of the use of a disposable cartridge as a receptacle for the paste to be injected is that there is no need to transfer the paste from the receptacle into the pressure chamber of the injection device as would be the case with a known injection device.

However, it has already been proposed to locate a receptacle in the injection device but this has previously been done in such a manner that during injection only the piston is put under pressure, with the result that the paste to be injected exerts substantial pressure on the walls and bottom of the cartridge. In order to resist this pressure on the cartridge walls, bottom and the connections between them, the cartridge needs to be strong, resulting in greater expense.

It is also possible to resist the great pressure during injection if the cartridge wall and bottom fit closely to the walls of the pressure chamber such that the walls of the pressure chamber support the bottom and wall of the cartridge over the entire surface. Such a cartridge, closely fitting in the pressure chamber, is however undesirable because cartridges with other dimensions can not be used without leakage.

In order to have the cartridge as cheap as possible, and consequently disposable after emptying, the walls, the bottom, and the connections therebetween can not be made very strong whilst, yet, especially in order to inject the paste-like substances deeply into capillary spaces great pressures must be applied. Therefore the internal dimensions of the pressure chamber and the external dimensions of the disposable cartridges are related in such a way that the cartridge is under generally all-sided influence of the compressed fluid admitted into the pressure chamber during the injection.

Hereby an effectively all-sided equal pressure is exerted on the cartridge due to which leakage of the substance to be injected out of the cartridge is effectively impossible. This pressure is only not present at the joint between the cartridge and the conduit leading to the nozzle and thus the paste-like substance is forced through this conduit to the nozzle.

Because the compressed fluid should be able to exert pressure onto, generally, the entire external surface of the cartridge, it follows herefrom that cartridges of widely differing dimensions within a maximum limit prescribed by the internal dimensions of the pressure chamber may be inserted. This is an important advantage in respect of the known cartridges the walls of which should closely fit the walls of the pressure chamber.

Owing to the application of paste-like substance it is not necessary to have the piston closely fitting to the wall of the cartridge.

Owing to the effectively all-sided pressure prevailing, also pressure is exerted uniformly over the cross section of the cartridge. Consequently, the piston does not act only as a propelling member, but also as a member for guiding the paste-like substance. The piston makes it possible to force the entire contents of the cartridge out, whereas without the piston it might be possible that part of the sticky contents could remain on the walls.

To render the disposable cartridge which also acts as receptacle for the filling substances, at the same time suitable for use with a filling substance consisting of two components which are to be mixed just before injection and to make it possible to pack both substances separately in one single cartridge, a cartridge may comprise a sleeve with a detachably secured lid at each end whilst a piston member which serves as a guide for the mixture to be injected when the mixture is forced out of the cartridge is positioned between both lids within the sleeve and, consequently, is also capable of serving as separation wall to divide the interior of the sleeve into two chambers.

Herefrom again appears the importance of the application of effecting all-side pressure, for without this all-sided pressure the lids should be firmly secured on the sleeve. Without all-sided pressure such a firm mounting is possible only by a strong permanent connection, due to which the lids are not removable, or by screw or bayonet joints owing to which the cartridge would become too expensive and could not be discarded or disposed.

The invention will be further described by way of example with reference to the accompanying drawings which illustrate a preferred embodiment of the invention in which:—

Fig. 1 is a diagrammatic longitudinal section of a device embodying the invention;

Fig. 2 is a longitudinal section of the preferred embodiment of the injection device according to the invention;

Figs. 3, 4, 5 and 6 are detail sections of auxiliary parts.

The device comprises a pressure vessel 1, provided with a connection which can be connected to a source for compressed fluid, such as compressed air. One or both end walls of the pressure vessel, which may be cylindrical, may be detachably secured to a cylindrical wall portion 5 of the pressure vessel 1. For example an end wall 6 is detachably screwed (Fig. 1) by means of screw thread onto the cylindrical wall portion 5 of the pressure vessel 1. A bayonet joint may be applied instead of screw thread (Fig. 2). At the same time one of the wall portions of the pressure vessel 1 in the embodiments illustrated, the detachable end wall 6, is provided with an opening 7. Apart from this opening the detachable end wall forms an airtight peripheral seal with the cylinder wall 5.

The needle or chisel-shaped nozzle 3 of arbitrary known construction may be detachably attached to the pressure vessel 1 by means of a clamping lock 8. In the embodiments illustrated the nozzle 3 is connected to a detachable conduit 2, which with the other end extends detachably into the opening 7 of the end wall 6.

A handle 9 also is mounted on the pressure vessel.

The substance or substances to be injected are introduced into the pressure vessel 1 but remain within their receptacle, i.e. a cartridge 10, by opening the pressure vessel 1 by removal of the end wall 6. In Fig. 1 the cartridge 10 is shown as located in the pressure chamber.

All external dimensions of the cartridge 10 are smaller than the internal dimensions of the pressure vessel 1. For this reason the compressed fluid, when admitted into the pressure vessel through the connection 4, is capable of exerting an effectively all-sided pressure on the cartridge 10 so that it is unnecessary to make the cylindrical cartridge wall 11, the lid 12 and its piston 14 strong per se, whilst a strong connection between the cartridge wall 11 and the lid 12 is not necessary either. This is possible, because an equally great pressure is exerted on the paste by the piston 14 as on the remainder of the surface of the cartridge. Only at a connecting member 13, to which the conduit 2 leading to the nozzle 3 is connected, does a lower pressure prevail, due to which the paste-like mass can escape through the conduit 2 under influence of the pressure exerted by compressed air.

By the application of an effectively all-sided pressure the cartridge 10 can be made so cheaply that the cartridge 10 can be discarded or disposed of after emptying.

For this purpose the cartridge 10 comprises a cylindrical cartridge wall 11 of paper board or other cheap material with, at one end a detachable lid 12 with a connecting member 13 therein serving to connect the interior of the cartridge 10 to the detachable conduit 2. Owing to the application of all-sided pressure, a strong connection between the lid 12 and the wall 11 is not necessary.

The other end of the cylindrical cartridge wall 11 is closed by means of a piston 14 which may be for example a disc with an upstanding edge as indicated in the drawing.

Because the material to be injected is paste-like there is less need for the circumference of the upstanding edge of the piston 14 to closely fit on the inner periphery of the cylindrical cartridge wall 11 than would be the case with thin liquids.

Owing to the effectively all-sided prevailing pressure, also pressure is exerted substantially uniformly over the cross section of the cartridge, consequently the piston does not act only as a propelling member but also as a member for the guiding of the paste-like substance. This piston makes it possible to force the entire contents of the cartridge out, whereas without the piston it might be possible that part of the sticky contents remains behind.

By the effectively all-sided pressure use of a cheap paper board cylindrical cartridge wall 11 and a cheap piston pressed from sheet material is made possible.

If desired, the piston 14 can be positioned more to the interior of the wall 11 and instead of the piston a lid may be located detachably on that end of the cylinder. The piston 14 then divides the cartridge into two chambers which may be of importance when the mass to be injected comprises two components, for example, synthetic resin and a hardening agent which should be mixed with each other only shortly prior to the injection. The piston then can maintain the two components separated from each other in one single cartridge, one of the two components then preferably being packed in an independent wrapping, whereby it is possible to remove forthwith this independently wrapped component from the cartridge to add it shortly before use to the component at the other side of the piston. It is clear that then the lids should be located detachably on the paper board cylindrical cartridge wall because as a result effected by edges on the lids being clamped with slight pressure around or in the cylindrical cartridge wall becausse as a result of the effectively all-sided applied pressure strong connections are superfluous.

Preferably the conduit 2 is a flexible tube

one end of which is connectable to the connecting member 13 and the other end to the nozzle 3. This tube is made of cheap material and, consequently can be replaced by another tube for each following cartridge. Consequently, if paste has remained behind in the tube, the tube can be discarded with each emptied cartridge. In the embodiment of the cartridge with the piston dividing the interior of the cartridge into two chambers and with the substance to be injected packed in the chamber between the lid with the connection member 13 and the piston, this tube for instance might be located in the chamber between the piston and the second lid, if this is desired, together with an amount of hardening agent in an independent wrapping.

A valve 15 which works by squeezing the flexible tube, may be mounted, if desired.

Preferably a valve is used with which the flexible tube 2 can be squeezed from the outside because a normal valve with a valve body within the tube could soon become filthy with the paste or even could get clogged up. When the paste hardens in a normal valve, the latter can only be cleaned with difficulty or not at all. These disadvantages may be avoided by the application of a cheap and continuous flexible tube which can be discarded after each use, and which can be locally squeezed by means of a valve member 15. The valve member 15 in this case does not contact the paste, thus only the tube 2 can become filthy. According to Fig. 1 the valve member can be pressed against the tube 2 by means of the lever 17. It is preferred, however, to operate the valve member 15 via a rod mechanism from a butt-shaped handle 9 according to Fig. 2 by means of for example a trigger 18. Thereby the entire device can be carried in one hand, while the trigger can be operated with the same hand.

Due to the repeated opening and squeezing of the tube 2 at the same place after a time in use it may lose its elasticity at that place. In the case of reduced elasticity the flexible tube will not resume its original sectional outline at the place when opened, which may disadvantageously influence the propulsion of the paste through the tube. Beside the reason that paste may adhere to the wall of the tube and may remain behind in the tube to harden there after emptying of the cartridge, it is also desirable to replace the tube by another due to the decreasing elasticity. Therefore the flexible tube 2 also can be removed from the device to be discarded after emptying the cartridge.

It is advantageous that the valve 15, which is located between the cartridge and the nozzle 3 is used instead of a valve in series with the connection 4 for controlling compressed fluid to the pressure chamber 1. For valve 15 is capable to stop immediately all supply of paste to the nozzle 3, whereas this is impossible with a valve in series with the connection 4. A valve in the connection 4 does stop the supply of compressed air, but it cannot prevent that the compressed air, already present in the pressure vessel 1 continues to force paste out until the pressure in the pressure vessel has been reduced to such an extent that the paste is not any more forced to flow out. Consequently, a valve in the supply of compressed air, renders it impossible to stop immediately the supply of paste to the injecting head with as result losses of paste. Having the valve on the tube 2 renders it possible to stop the supply of paste immediately the paste, which has been injected into the wood, starts flowing out of the wood again because the holes in the wood have been filled, and consequently paste can be saved.

Figs. 3 and 4 are longitudinal sections of auxiliary parts which may be mounted on the injection nozzle 3 to press against the wood in the immediate vicinity of the nozzle in order to prevent in this way the outflow of paste from the wood along the outside of the nozzle. For that purpose the auxiliary part is provided with a channel 19 fitting the outer periphery of the injection nozzle 3, through which the channel the injection head, consequently, should extend into the wood or the crack. Each auxiliary part is in the form of a block and is provided with a resilient bracket 20 which can snap into a slot 21 in the nozzle to retain the auxiliary part on the injection nozzle 3.

In order to render various positions of the injection device possible with respect to the surface to be treated, which may be necessary in case of portions which are difficult to reach, the channel 19 may be oblique instead of perpendicular. In the case of an auxiliary part with a longitudinal section according to Fig. 3 and a cross section according to Fig. 5, the injection nozzle is perpendicular to the surface to be treated. With an auxiliary part with a longitudinal section according to Fig. 3 and a cross section according to Fig. 6 the nozzle has an oblique position. Also an auxiliary part with a longitudinal section according to Fig. 4 and a cross section according to Fig. 5 or 6 is possible.

A piercer 16 to pierce holes into the wood to be treated may take the form as represented in the drawing. This piercer is indicated with full lines in its utilizing position whereas the piercer may be turned back to its rest-position indicated by dotted lines. In Fig. 2 the piercer is represented only in its rest position.

To render the device ready for use the pressure vessel 1 is opened by removing one of the end walls, e.g. end wall 6.

In the artificial resin, for example, is to be mixed with a hardening agent, this should take place on the spot shortly before use by removing the lid 12 with the connecting member 13, whereupon the hardening agent is added to and mixed with the paste-like artificial resin. Finally the lid 12 can again be mounted on the cylindrical wall of the cartridge.

Thereupon the flexible tube, constituting the conduit 2 is shifted onto the connecting member 13 of lid 12. The outside diameter of connecting member 13 has been chosen such that the flexible tube 2 at that spot gets slightly stretched in cross-section whereby after introduction of tube 2 through opening 7 into the end wall 6 correct sealing of the tube 2 onto the opening 7 can be obtained.

The end wall, together with the mounted cartridge 10 is then mounted on the pressure chamber 1 again.

The other end of the flexible tube 2 thereupon is connected to the injection nozzle 3.

By now admitting compressed air into the closed pressure chamber through the connection 4, the walls of the cartridge 10 are subjected to an effectively all-sided pressure because all external dimensions of the cartridge are smaller than all internal dimensions of the pressure vessel 1. Because of this all-sided pressure there is no need to make the walls of the cartridge strong in such a way as to be capable of withstanding pressures generally used for injecting pastes into wood, for example 2 to 6 atmospheres. Because of this effectively all-sided pressure in the pressure vessel 1, the cartridge may be constructed cheaply and is therefore disposable.

By the pressure prevailing in the pressure vessel the piston 14 presses onto the paste-like filler material, which flows to and through the injection nozzle 3 through the connecting member 13 and the conduit 2. Because of effectively all-sided pressure prevailing inside the pressure chamber, the piston 14 acts to maintain the paste-like mass under uniform pressure over the entire section of the cartridge. Thus there is no need for the piston to closely fit the cartridge wall.

If the cartridge has been pressed empty, the pressure vessel 1 can be opened again by removal of the end wall 6 and the empty cartridge can be replaced by a filled one, and if desired, the conduit 2 may also be replaced by a clean one.

WHAT WE CLAIM IS:—

1. An apparatus for injecting paste-like substances comprising a pressure chamber which is adapted to be connected to a source of compressed fluid, an exchangeable and disposable cartridge for containing the paste-like substance, the cartridge being located in said pressure chamber so that its outer periphery is completely spaced from the wall of the pressure chamber whereby admittance of compressed fluid into said pressure chamber places the cartridge under effective all-sided pressure from the compressed fluid, an injector nozzle connected to the pressure chamber and communicating with the cartridge, the cartridge having a piston propellable by the pressure of compressed fluid in said pressure chamber toward one end wall of the cartridge to thereby cause paste-like substance to be extruded through the nozzle, and a replaceable connection locatable, in use, in the communication between the nozzle and the cartridge.

2. An apparatus as claimed in claim 1, in which the nozzle and the cartridge are axially aligned.

3. An apparatus as claimed in claim 1 or claim 2, in which the replaceable connection is flexible.

4. An apparatus as claimed in any one of claims 1 to 3 in which the replaceable connection is an expendible detachable tube.

5. An apparatus as claimed in any one of claims 1 to 4, in which the nozzle is carried directly by and is detachable from the pressure chamber.

6. An apparatus as claimed in any one of claims 1 to 5 in which the cartridge comprises a sleeve with at one end a lid constituting said piston and formed of a disc with an upstanding edge, and with a detachable lid at the other end of the sleeve, the latter lid being provided with a connecting member for connection to the replaceable connection.

7. An apparatus as claimed in any one of claims 1 to 6 in which the piston is retained and guided only by the inside wall surface of the cartridge.

8. An apparatus as claimed in any one of claims 1 to 5 in which the cartridge comprises a sleeve and both ends of the sleeve are provided with lids, which can be detached without damaging the sleeve, the piston being within the sleeve and dividing the interior of the sleeve into two chambers and the lid remote from the nozzle being detachable prior to use to expose the piston to the pressure chamber interior.

9. An apparatus as claimed in claim 8 in which the paste-like substance is located in the sleeve chamber between the piston and the lid located adjacent the nozzle and in which an independently wrapped hardening agent and the replaceable connection are locatable in the sleeve chamber at the other side of the piston the hardening agent and replaceable connection being removable from the sleeve chamber prior to use.

10. An apparatus as claimed in claim 4 when appendant to claim 3 having a valve

member which is capable of squeezing the flexible tube from its exterior at a position along its length when located in use between the pressure chamber and the nozzle.

11. An apparatus as claimed in claim 10 in which the valve member is arranged to be operated from a handle for supporting the pressure chamber.

12. An apparatus as claimed in claim 6 together with either one of claims 10 or 11 in which in use the flexible tube at one end is adapted to be clamped between an opening in an end wall of the pressure chamber and the connecting member on said detachable lid of the cartridge.

13. An apparatus as claimed in any of the preceding claims, including an auxiliary part detachably mounted on the nozzle and comprising a block with a channel therethrough, the axis of the channel being perpendicular or inclined to a surface of the block, the channel being dimensioned so that the nozzle fits closely thereinto and a resilient bracket being mounted on the auxiliary part in snap engagement with a slot on the nozzle to hold the auxiliary part onto the nozzle.

14. An apparatus for injecting paste-like material comprising a pressure chamber which is adapted to be connected to a source of compressed fluid and a cartridge constructed and arranged and adapted to be operated substantially as hereinbefore particularly described with reference to and as illustrated in Fig. 1 or in Fig. 2 of the accompanying drawings.

15. An apparatus as claimed in any of the preceding claims including an auxiliary part constructed and arranged substantially as hereinbefore particularly described with reference to and as illustrated in Figs. 3, 4, 5 and 6 of the accompanying drawings.

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1179151 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

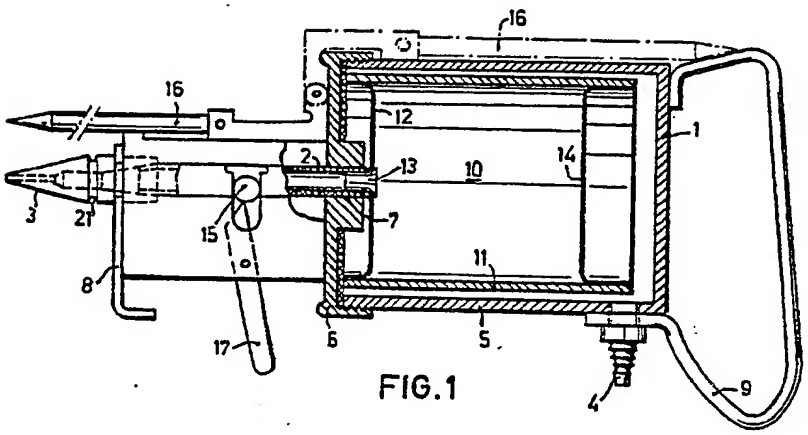

FIG.1

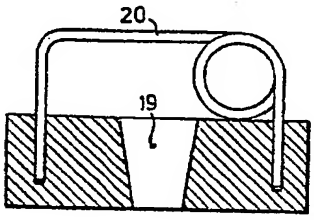

FIG.3

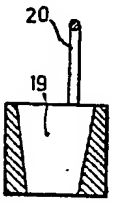

FIG.5

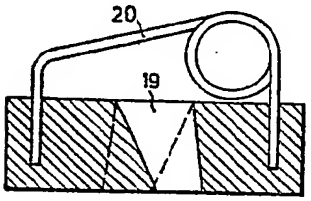

FIG.4

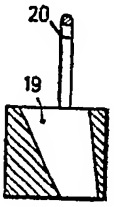

FIG.6

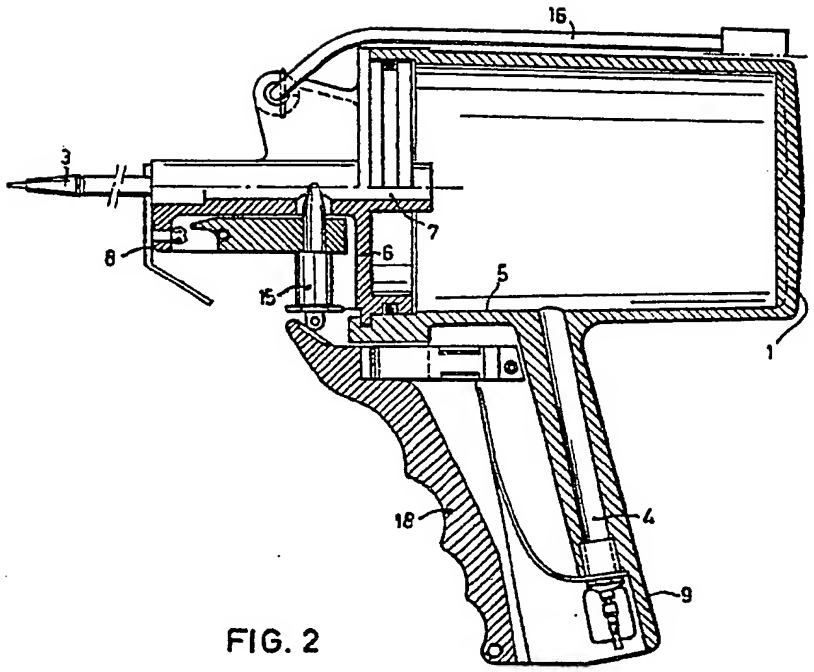

FIG. 2